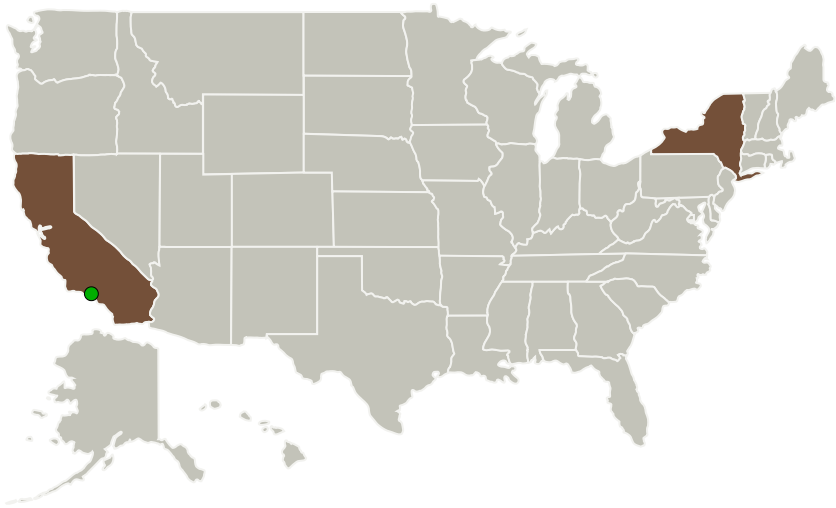
Extreme Temperature Gearhead, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

In response to the need for actuators, particularly, gear heads, that can operate in the harsh Venusian environment for extended periods of time, on the order of several days to weeks, Honeybee Robotics proposes to develop and demonstrate an extreme temperature compatible gear head. The proposed effort will consider the novel design of gear bearings, which is capable of handling wide range speeds and loads requirements, but will also incorporate standard bearings as a means of constraining relative axial motions of the gears. The high gear reductions possible within a single stage, coupled with the already compact size make this innovation ideal for spaceflight hardware where size and weight are at a premium, specifically to the extreme conditions of Venus. During Phase I, a first-generation prototype gear head will be designed, built, and tested in Venus-like conditions (486oC temperature and mostly CO2 gas environment). Phase I testing will verify the feasibility of the design and confirm that the gear head can operate at 486oC for an extended period of time. In a potential Phase II effort, an extreme environment compatible gear head will be developed to TRL 6. Fully developed and optimized versions of this gear head, when integrated with the offeror's high temperature motors, could be used to actuate drills, robotic arms, and other devices outside of an environment-controlled landed platform on the surface of Venus.

Primary U.S. Work Locations and Key Partners



Extreme Temperature Gearhead, Phase I

Table of Contents

Extreme Temperature Gearhead, Phase I

Completed Technology Project (2010 - 2010)

Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New York

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140046)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Honeybee Robotics, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jerri Ji

Co-Investigator:

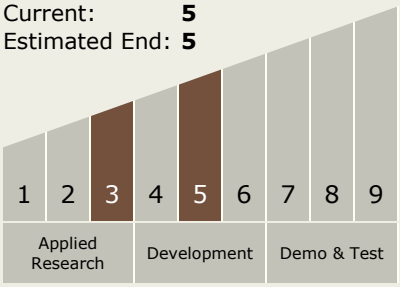
Jerri Ji

Extreme Temperature Gearhead, Phase I

Completed Technology Project (2010 - 2010)

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.4 Surface Mobility

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System